



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Hansong Zhang

Appl. No.: 09/923,398

Filed: August 8, 2001

For: **Method, System, and Computer
Program Product for Visibility
Culling of Terrain**

Confirmation No.: 2363

Art Unit: 2671

Examiner: Nguyen, Phu K.

Atty. Docket: 2198.010000

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Technology Center 2600

Letter to PTO Draftsman: Submission of Formal Drawings

Commissioner for Patents
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Alexandria, VA 22313-1450

Sir:

Submitted herewith are seventeen (17) sheets of formal drawings with Figures 1-2, 3A-3B, 4-5, 6A-6B, 7, 8A-8B-8C-8D, 9A-9B, and 10-15, corresponding to the informal drawings submitted with the above-captioned application. Identification of the drawings is provided in accordance with 37 C.F.R. § 1.84(c). Acknowledgment of the receipt, approval, and entry of these formal drawing(s) into this application is respectfully requested.

It is not believed that an extension of time is required, other than any already provided herewith. However, if an extension of time is needed to prevent abandonment of the application, then such extension of time is hereby petitioned. The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

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Attorney for Applicant
Registration No. 45,321

Date:

June 15, 2004

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It is respectfully requested that the attached postcard be stamped with the date of filing of these documents, and that it be returned to our courier. In the event that extensions of time are necessary to prevent abandonment of this patent application, then such extensions of time are hereby petitioned.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

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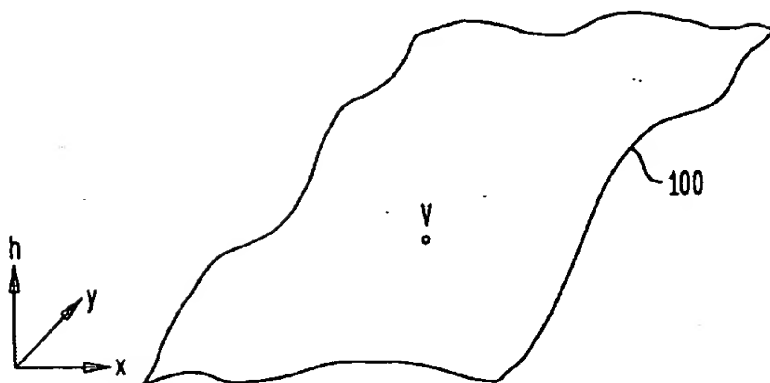


Kendrick P. Patterson
Attorney for Applicant
Registration No. 45,321

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Enclosures

FIG. 1



EXAMPLE OF A TERRAIN DEFINED BY A HEIGHT FIELD

FIG. 2

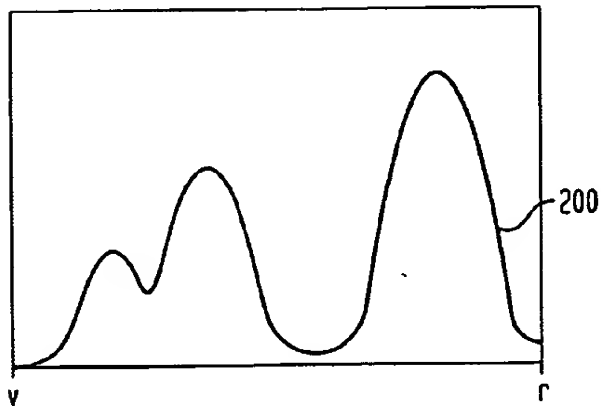


FIG. 3A

OCCLUSION HEIGHT FIELD GENERATED BY
PERSPECTIVE HEIGHT FIELD PROPAGATION

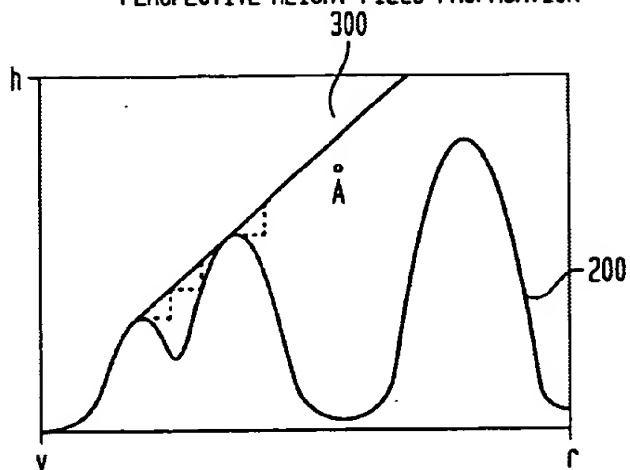
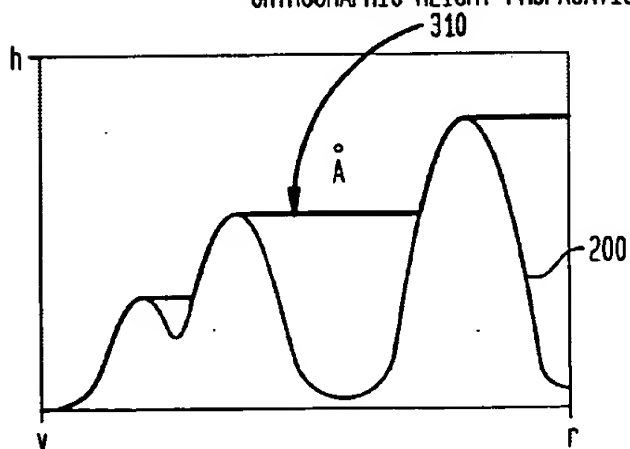


FIG. 3B

OCCLUSION HEIGHT FIELD GENERATED BY
ORTHOGRAPHIC HEIGHT PROPAGATION





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FIG. 4

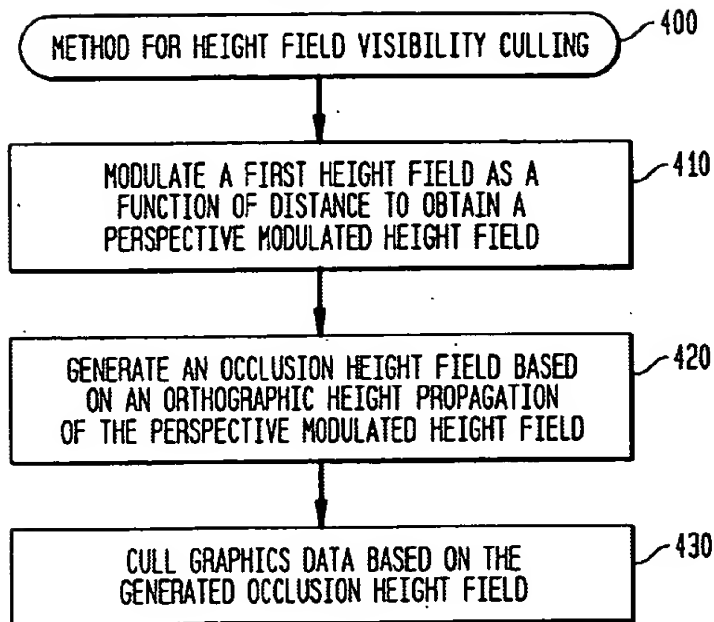
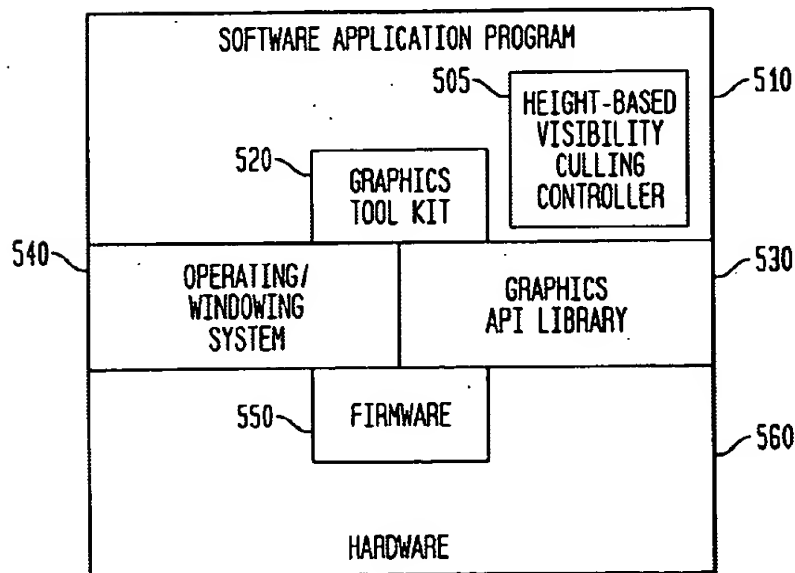


FIG. 5

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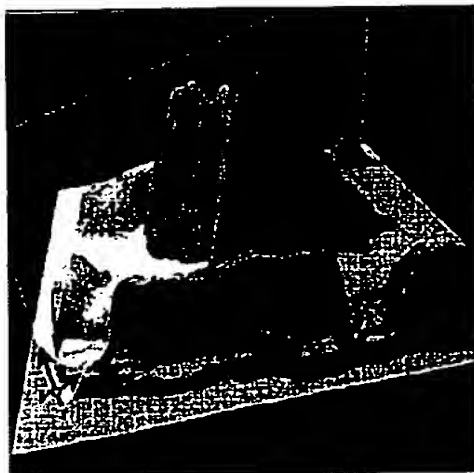


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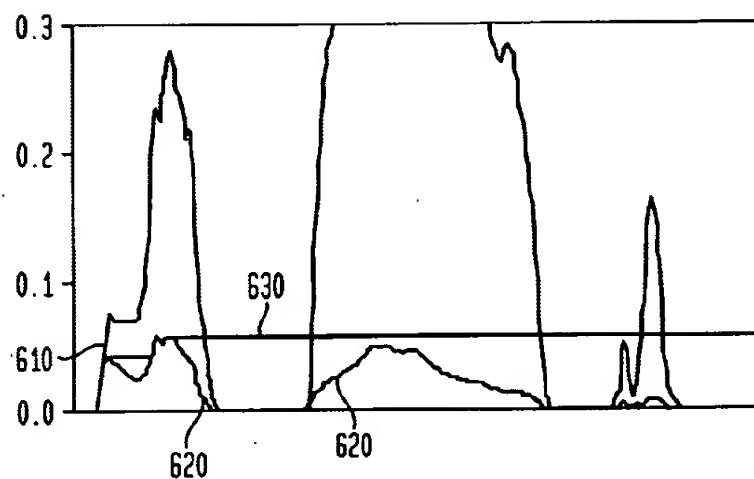
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FIG. 6A



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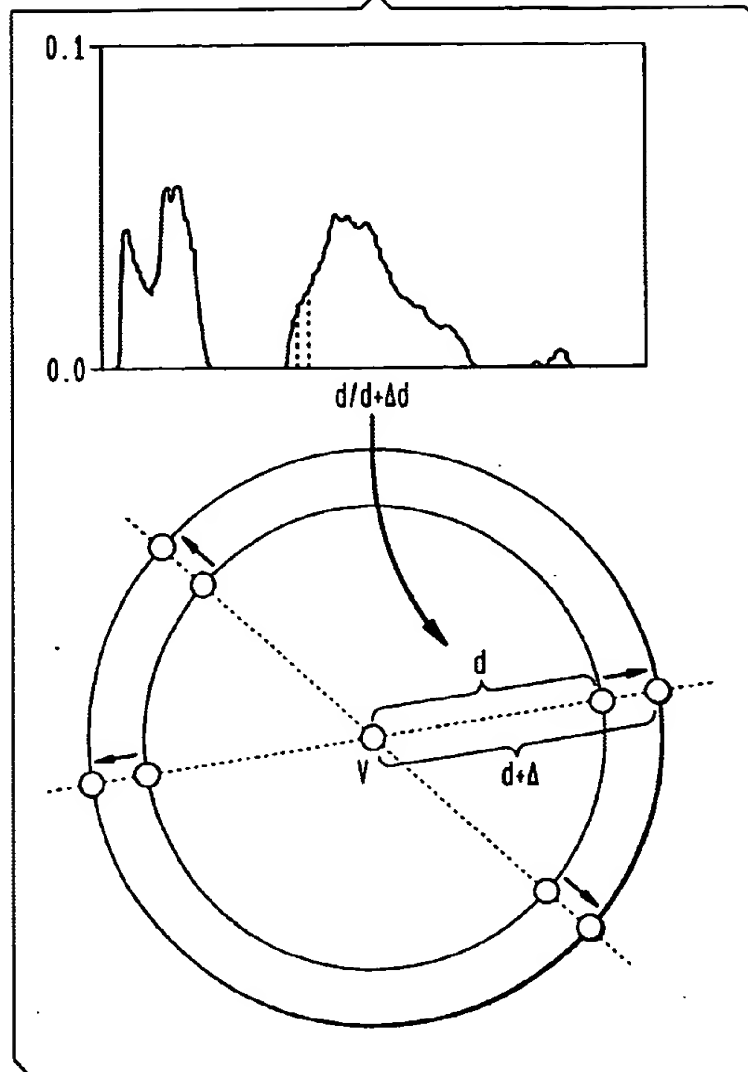
FIG. 6B



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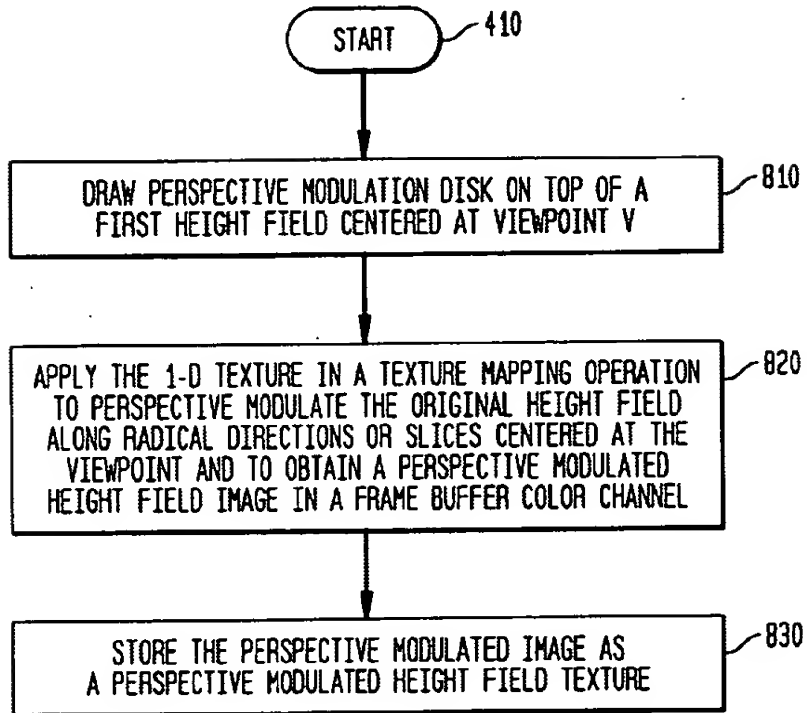
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FIG. 7



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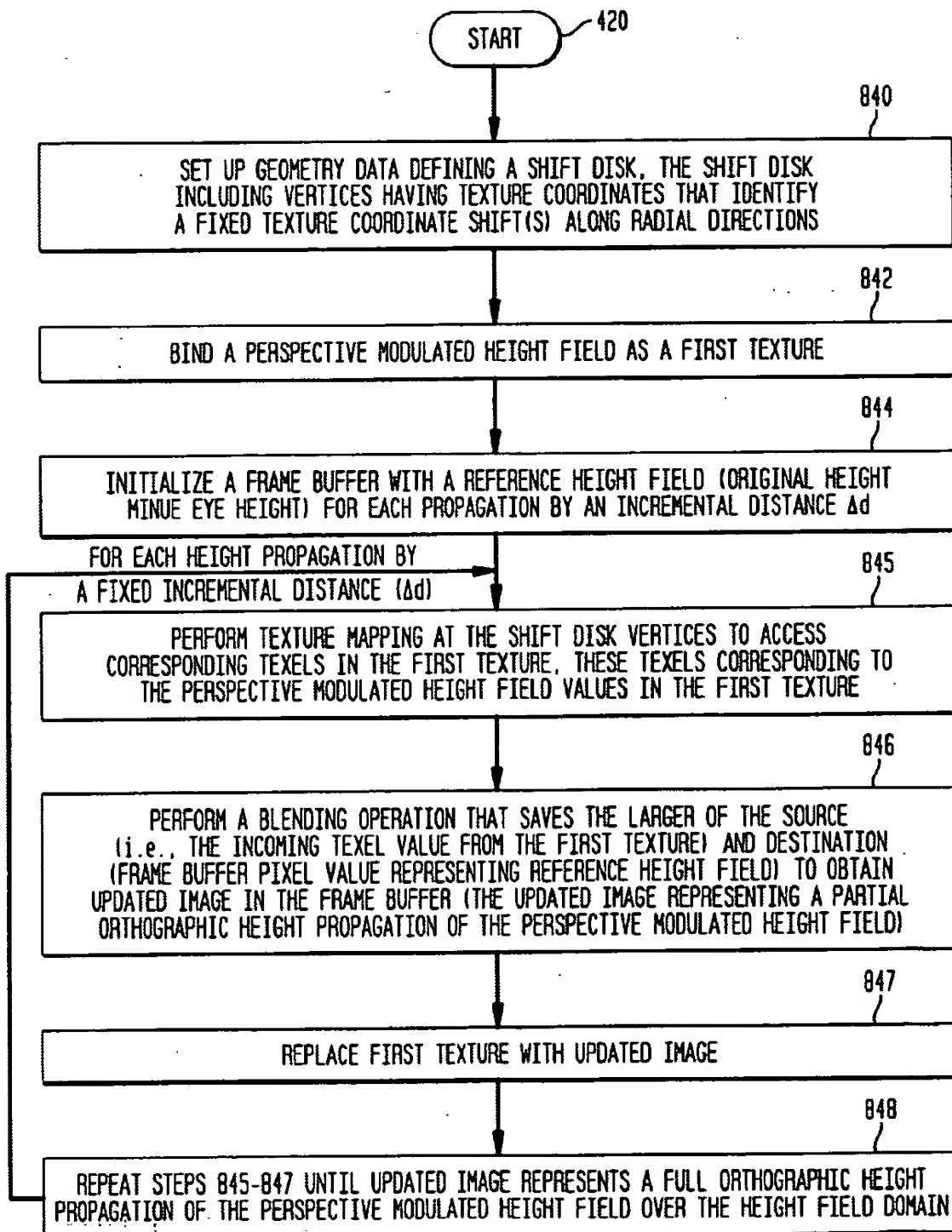
FIG. 8A



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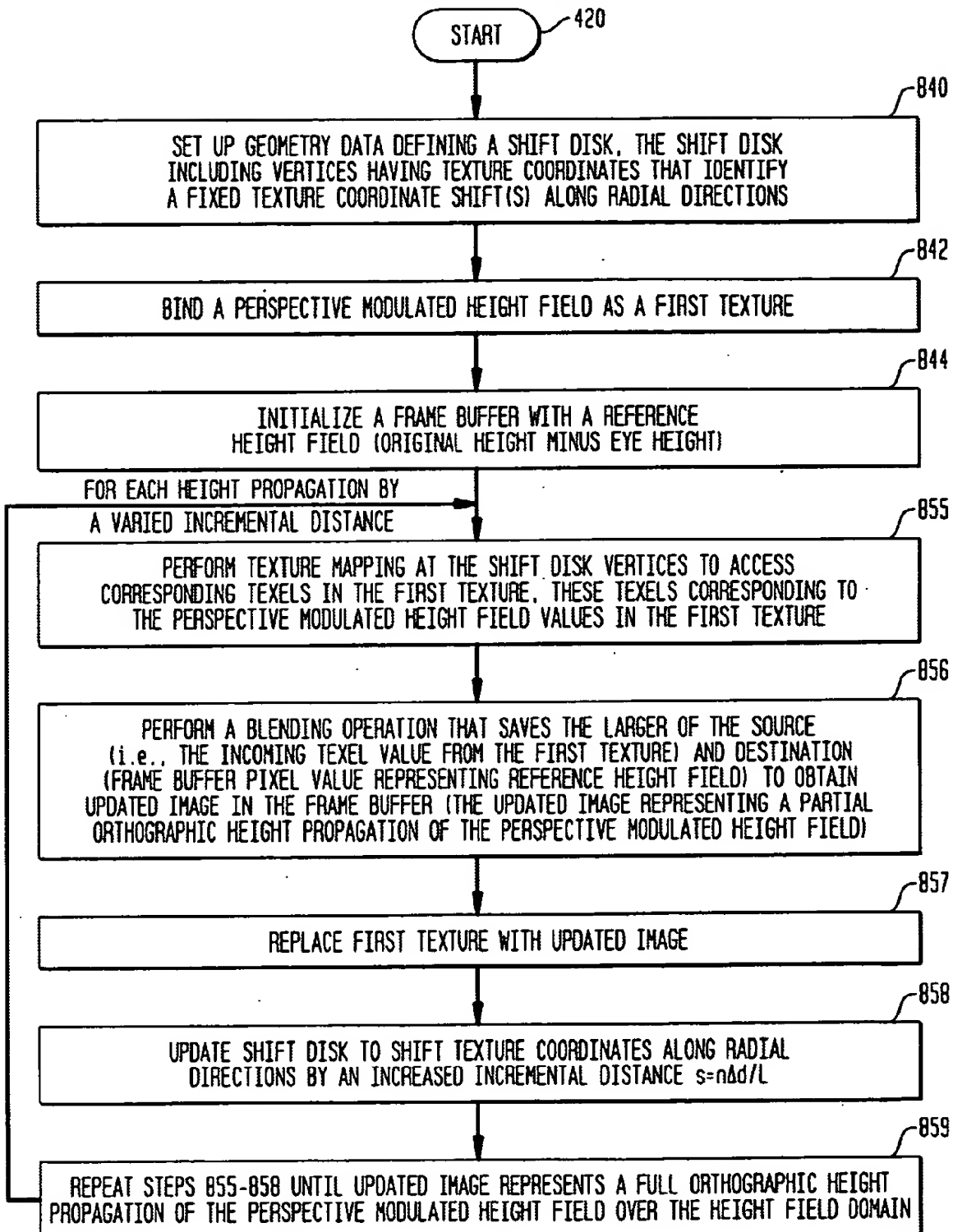
FIG. 8B

SHIFT DISK-HEIGHT PROPAGATION FIXED AT EACH ITERATION



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FIG. 8C

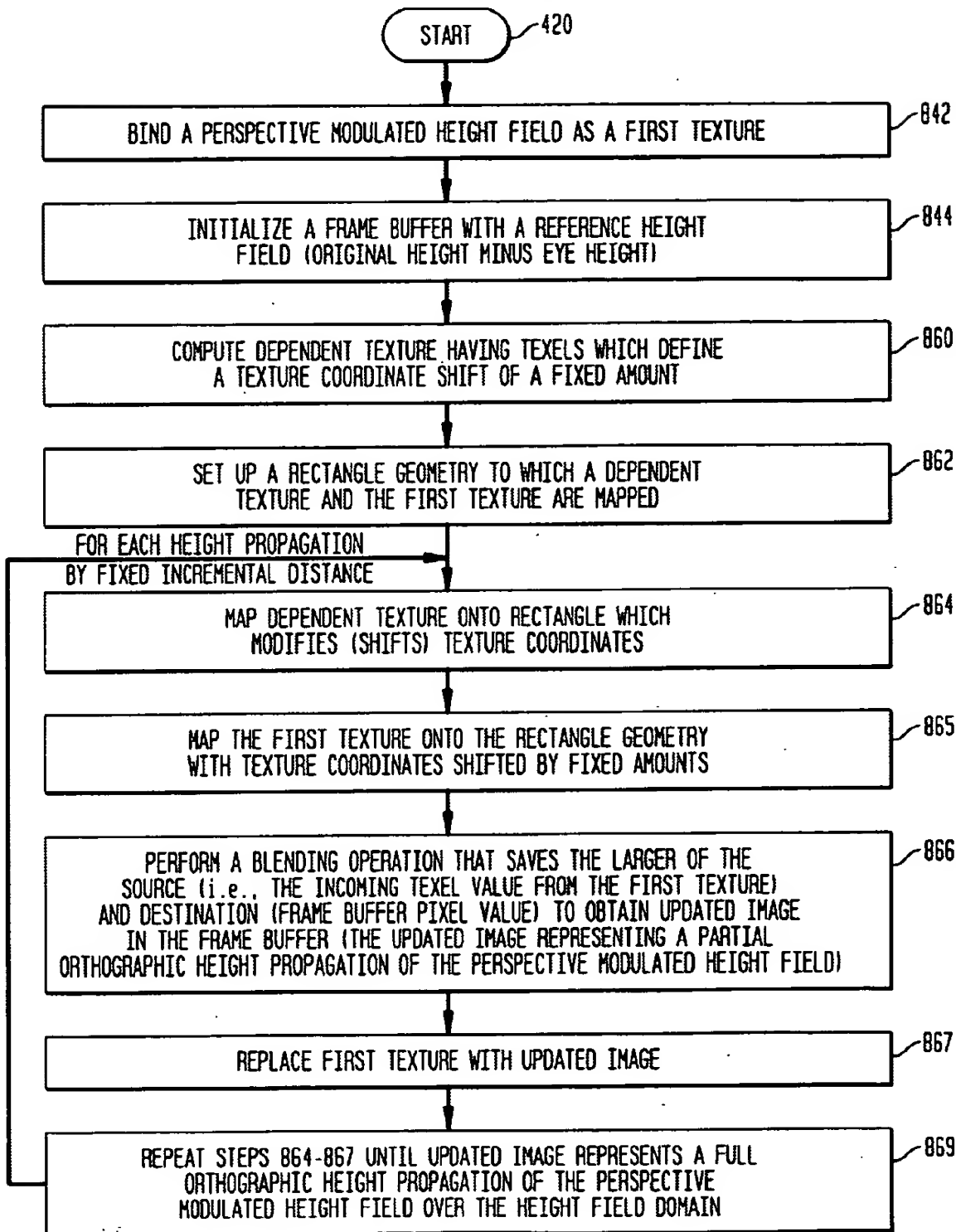
SHIFT DISK-HEIGHT PROPAGATION VARIED AT EACH ITERATION



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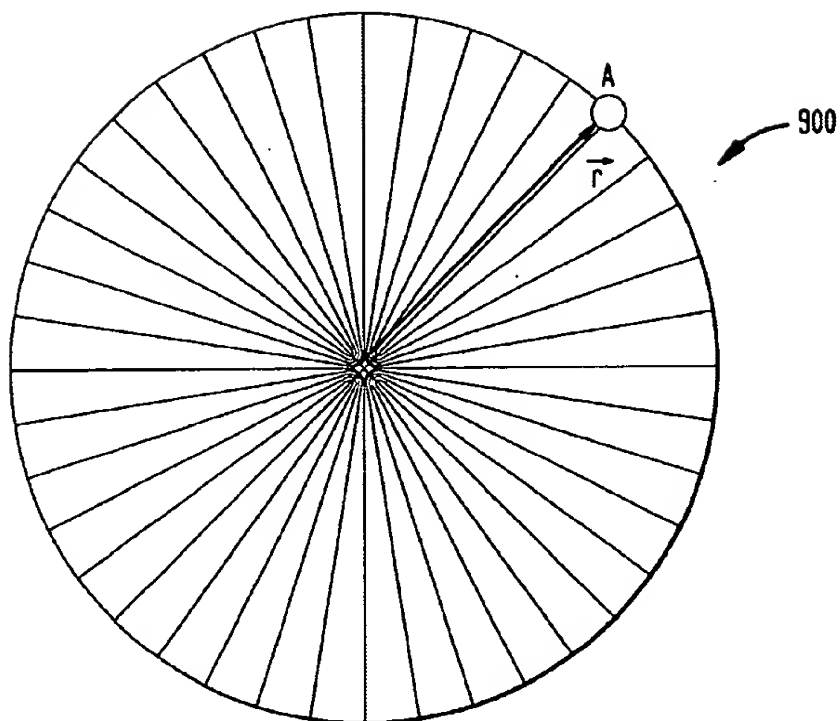
FIG. 8D

SHIFT TEXTURE-HEIGHT PROPAGATION FIXED AT EACH ITERATION



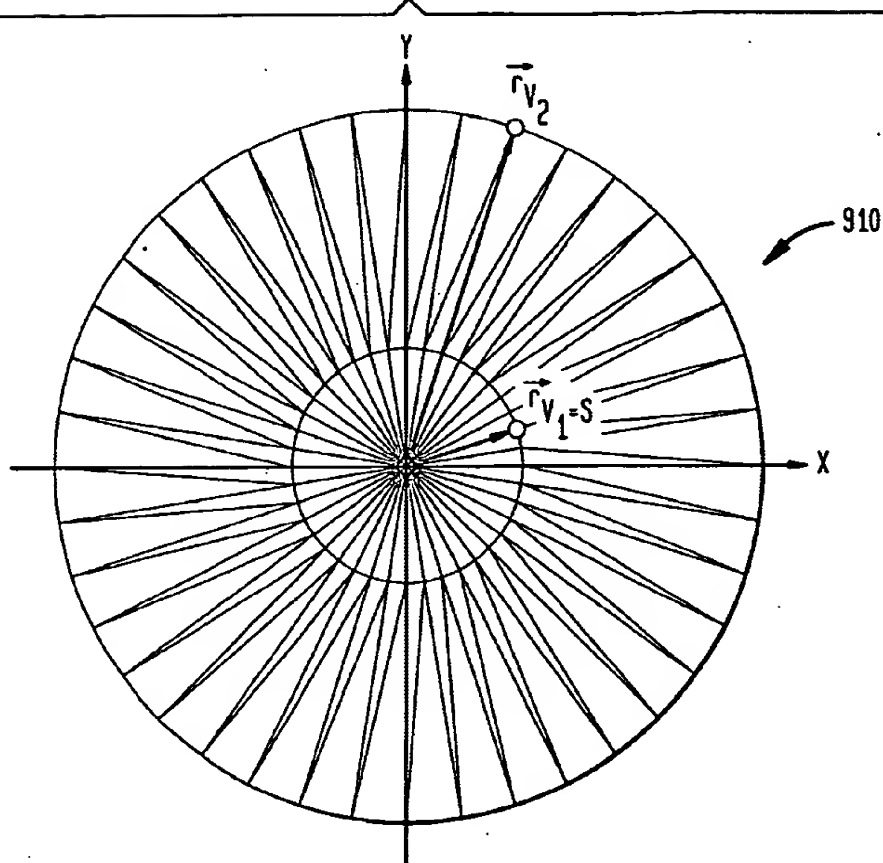
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FIG. 9A



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FIG. 9B



V_1 's POSITION ($|\vec{r}_{V_1}| \cos \theta_{V_1} / 2 + 0.5$, $|\vec{r}_{V_1}| \sin \theta_{V_1} / 2 + 0.5$)

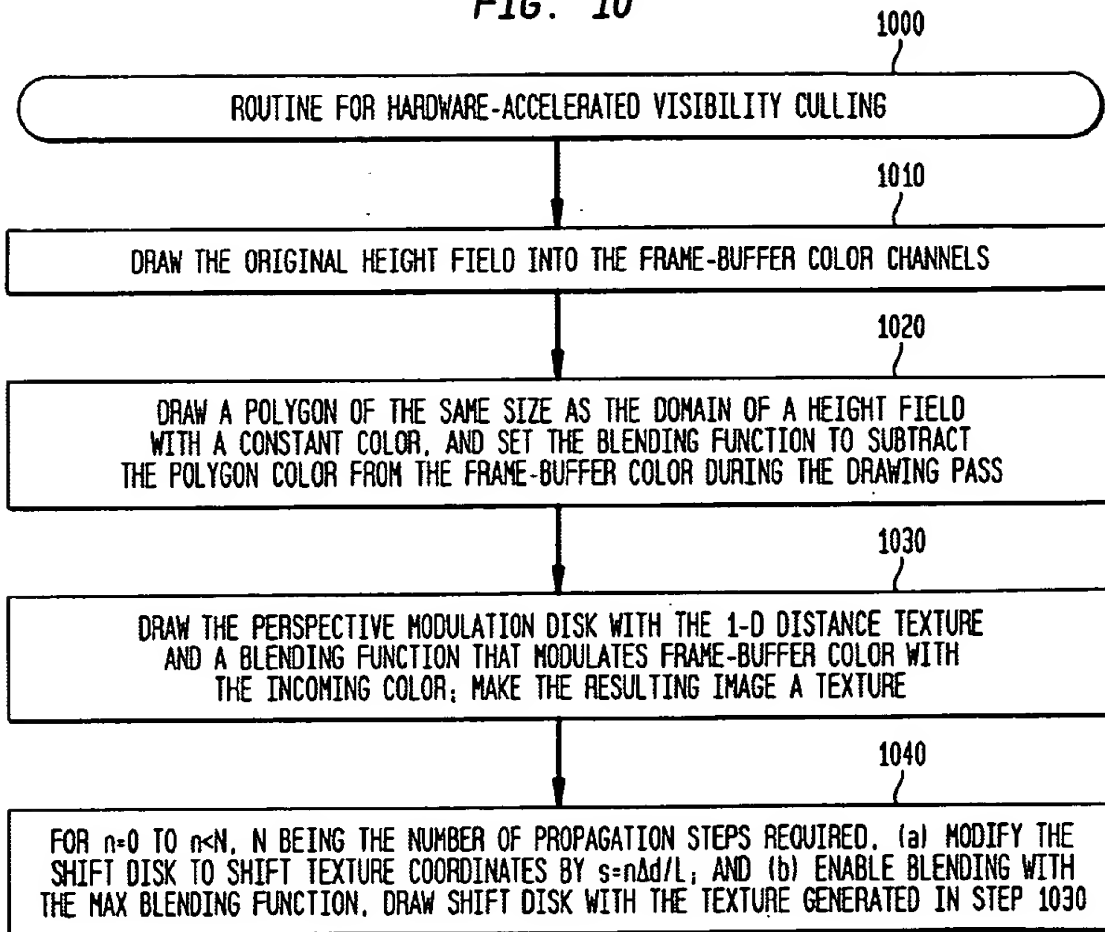
V_1 's TEXTURE COORDINATES: (0.5, 0.5) (SAME AS THE DISK CENTER)

V_2 's POSITION ($|\vec{r}_{V_2}| \cos \theta_{V_2} / 2 + 0.5$, $|\vec{r}_{V_2}| \sin \theta_{V_2} / 2 + 0.5$)

V_2 's TEXTURE COORDINATES: ($|\vec{r}_{V_2}| \cos \theta_{V_2} / 2 + 0.5$, $|\vec{r}_{V_2}| \sin \theta_{V_2} / 2 + 0.5$)

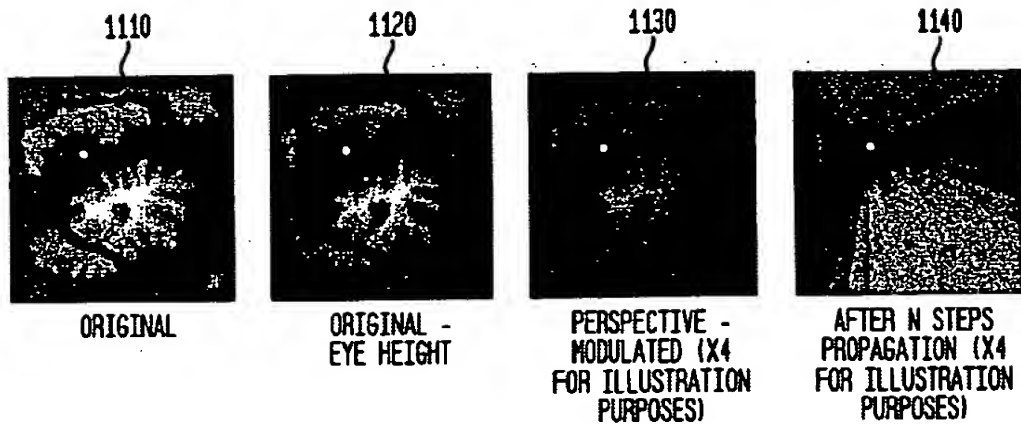
THE SHIFT DISK. V_1 REPRESENTS ANY VERTEX ON THE INNER RING, AND V_2 THAT OF THE OUTER. s IS THE AMOUNT OF SHIFT. RADIUS OF THE INNER RING IS s . θ IS THE ANGLE WITH THE X AXIS. A TRANSLATION TO THE EYE POSITION IS ADDED TO BOTH POSITIONS AND TEXTURE COORDINATES USING THE MODEL-VIEW AND THE TEXTURE MATRIX, RESPECTIVELY, WHEN THE DISK IS DRAWN.

FIG. 10



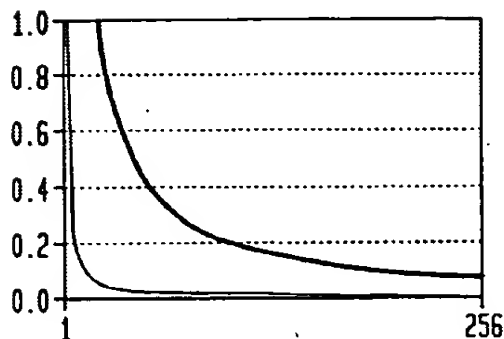
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FIG. 11



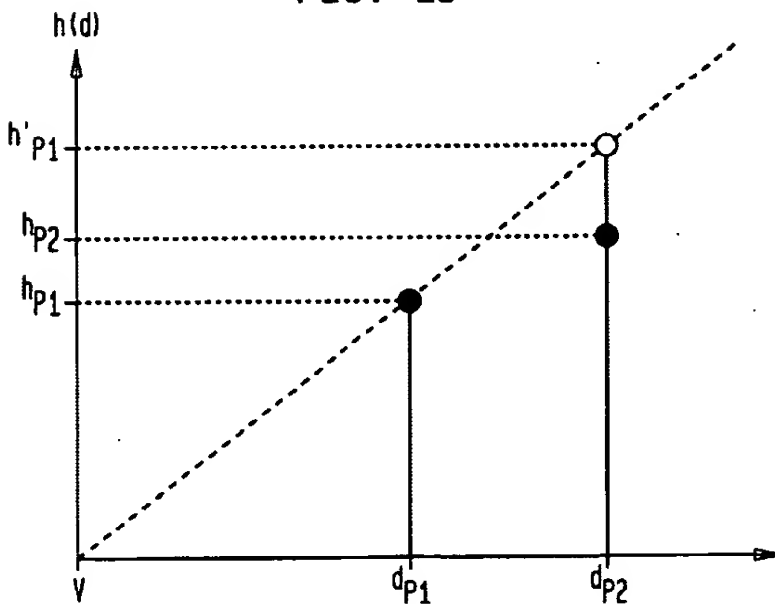
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FIG. 12



THE $1/d$ FUNCTION (THE THINNER LINE) AND THE SAME FUNCTION MULTIPLIED BY A FACTOR OF 20 (i.e., f/d 20). USING THE LATTER FOR PERSPECTIVE MODULATION RESULTS IN MORE USEABLE RANGE IN THE MODULATED HEIGHT FIELD AND THUS THE OCCLUSION HEIGHT FIELD DERIVED FROM IT.

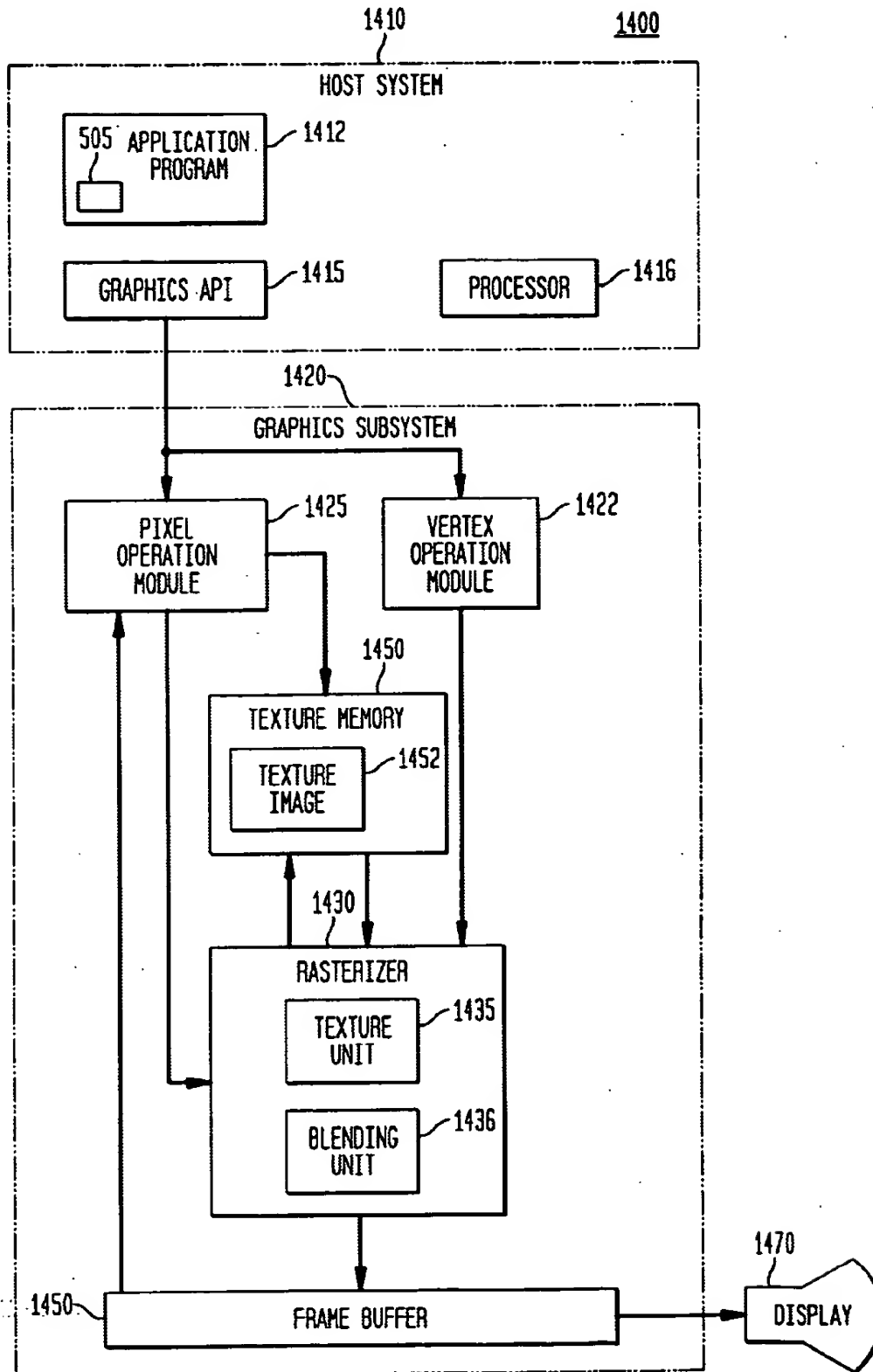
FIG. 13



ORTHOGRAPHIC HEIGHT PROPOGATION ON A HEIGHT FIELD, AFTER PERSPECTIVE MODULATION, IS EQUIVALENT TO PERSPECTIVE HEIGHT PROPAGATION ON THE ORIGINAL HEIGHT FIELD

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FIG. 14





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FIG. 15

